

Appendix E – Vegetation

Vegetation Information Submitted
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Study Area

The study area for vegetation includes an area approximately 1/4 mile on either side of each of the proposed segments, for a total of a 1/2-mile-wide strip centered on the proposed route.

Methodology

Information on project area vegetation was obtained from a variety of sources to determine which plant communities are present within the project area. Federal agencies provided information on the plant communities that occur on the lands they manage. The plant communities within the project segments that traverse the Hanford Reach National Monument have been named and mapped. The botanist from the Wenatchee Bureau of Land Management (BLM) District provided general information on plant communities that occur along BLM lands, but the BLM has not mapped plant communities within the project area. The Yakima Training Center (YTC) wildlife biologist was contacted to supplement information on plant communities within the YTC Management Plan.

Very little information is available about the plant communities on state and private lands within the project area. As a result, it is difficult to determine the species of shrubs, grasses, and forbs (flowering plants that are not grasses) within plant associations and the quality of the plant community in particular areas relative to other portions of the project area. Studies on regional plant communities within the Columbia Basin provided general descriptions of plant associations, but little site-specific information. The United States Geological Survey (USGS) National Land Cover Data Maps were used to calculate general vegetation cover types along various project segments. Aerial photographs and USGS quadrangle maps covering the project area were also used for information on landforms, water features, and elevation. The field data on sensitive wildlife occurrences mapped on Washington Department of Fish and Wildlife (WDF&W) Habitats and Species Maps sometimes have some information about plant communities in locations near the project area, although this information was usually very general in nature.

Some site-specific information is available. The Washington Natural Heritage Program (WNHP) tracks the occurrence of high quality plant associations and keeps information on the location of these communities in their database. Because it is likely that some areas within the project area have not been visited by botanists or ecologists, some high quality plant communities may occur within the project area, but are not included within the WNHP database.

During a brief field visit in January 2001, some project area plant communities were viewed from the ground in areas near major roads, and from helicopter in inaccessible areas. This visit provided limited information on plant community types within the project area due to the time of year the visit took place. A site visit was made to the area of the proposed Wautoma Substation (Segments C and D) in June 2001 to characterize site vegetation.

A rare plant survey was conducted along the Preferred Alternative during August 2001, and further rare plant surveys will occur in Spring and Fall 2002.

Plant Communities of the Study Area

The diversity of plant species and quality of vegetation in the study area can be assessed by determining the plant community, found in different locations. Table 2, lists the scientific name for each plant species discussed below.

The vegetation type found in most of the study area is referred to as shrub-steppe, with some grasslands (Franklin and Dyrness, 1973). With the exception of some riparian areas, few trees are able to survive in this arid landscape. The dominant woody vegetation on most upland sites consists of shrub species, predominantly sagebrush species. The understory of herbaceous plants in shrub-steppe was dominated by native perennial bunchgrasses prior to European settlement. Within the project area, native bunchgrass-dominated communities are no longer common due to invasion by annual grasses and weedy species after various types of disturbance (Quigley, 1999).

Shrub-steppe vegetation in the study area is characterized as a potential big sagebrush/bluebunch wheatgrass zone (Daubenmire, 1970). This is the community that is expected to occur without disturbance, alteration of habitat, or invasion by non-native species. However, most of the vegetation in the study area has been disturbed, and as a result, bluebunch wheatgrass is rarely the dominant grass species. Historic and present day causes of disturbances to vegetation in the study area include converting land to agricultural uses, grazing, fire, construction, road building, the deliberate and inadvertent introduction of non-native species, and maneuver training exercises on the YTC. Disturbance reduces native plant species cover and diversity, changes species composition and structure, and increases the likelihood of invasion by non-native species (Rickard, 1988). Native bunchgrasses and native forbs are particularly vulnerable to disturbances and have decreased dramatically in most portions of the shrub-steppe.

The dominant shrubs in upland areas commonly include several species of sagebrush, including big sagebrush, threetip sagebrush, stiff sagebrush, low sagebrush, bitterbrush, and several species of rabbitbrush (gray/rubber and green). Historically shrubs were associated with native perennial bunchgrasses such as bluebunch wheatgrass, Sandberg's bluegrass, needle-and-thread grass, and Idaho fescue (Franklin and Dyrness, 1973). In most areas today, non-native species, including cheatgrass, are now dominant. Shrubs and grasses are associated with various semi-woody or herbaceous perennials and annual or perennial forbs, which vary in species composition from area to area.

In the study area, very few riparian areas have a tree overstory, and shrub-lined riparian areas are more common. Common trees found include black cottonwood, aspen, and chokecherry; shrubs include various species of willow, wood's rose, serviceberry, black hawthorn, golden currant, wax currant, and blue elderberry. The herbaceous understory consists of grasses and forbs, with sedges, rushes, and other water-tolerant species in wetter areas. Drier riparian areas are typically vegetated with upland shrubs, including sagebrush, bitterbrush, gray rabbitbrush, wild rose, and ocean-spray, with upland grasses and forbs in the understory.

Rocky areas such as rock outcrops, rocky slopes, and canyons are common in shrub-steppe. Different kinds of rock substrates, from gravel to boulder-strewn areas, support different plant species. Large shrubs such as serviceberry and wax currant tend to occur in rocky riparian areas. Finely graveled slopes support low shrubby species and forbs, such as Oregon sunshine, purple sage, desert buckwheat, and other species, including some rare plant species.

The agricultural lands in the valley are mainly in cropland with small adjacent areas that may have some remnants of native plant communities. These areas are generally disturbed and are

vegetated by non-native species, including the weed species commonly found in agricultural lands.

WNHP High Quality Plant Communities

The Washington Natural Heritage Program (WNHP) tracks the occurrence of “high quality plant communities” within “high quality terrestrial ecosystems” (WNHP Website). Two WNHP high quality plant communities occur along line segments. The Wyoming big sagebrush/bluebunch wheatgrass shrubland community occurs in one small location along Segment A. The bitterbrush/Indian ricegrass shrubland community occurs in a broad band north of the Columbia River along Segments D, E, and F.

Vegetation Cover Types

The USGS produces National Land Cover Data Maps that include some information on vegetation. These maps were used to calculate vegetation cover types along various project segments, presented in Table 1, Vegetation Cover Types. This data provides a measure of the amount of existing native vegetation along each segment. The two categories, Shrubland and Grasslands or Herbaceous, represent areas with plant communities that are likely to have some native species remaining although the condition of these areas could vary from fairly pristine to very degraded. Areas where agricultural activities occur are unlikely to recover and return to natural vegetation, even if abandoned. The information on tree cover illustrates how few trees exist in the study area and the importance of tree-lined riparian areas.

Table 1. Vegetation Cover Types

Vegetation Cover	Cover Along Each Segment (miles)						
	A	B _{NORTH}	B _{SOUTH}	C	D	E	F
Trees	0.68	0.00	0.00	0.19	0.18	0.05	0.00
Shrubland	26.22	6.17	6.96	22.07	10.09	12.87	23.01
Grasslands or Herbaceous	1.73	2.87	2.91	7.46	7.23	3.91	7.76
Agricultural	0.53	0.00	0.00	0.00	8.85	5.87	0.39

Source: USGS National Land Cover Data Maps, 2000

Segment A

The vegetation of Segment A is mainly shrubland, with very little grassland and agricultural land. Portions of Segment A support an attractive shrub-steppe plant community known as a **lithosol** community (St.Hilaire, 2001). Because big sagebrush and many grass species cannot survive in rocky soils over basalt, the lithosol zone is known for having spectacular spring wildflower displays (Taylor, 1992). Portions of Segment A have areas of lithosols that support stiff sagebrush, Sandberg’s bluegrass, and a variety of wildflowers species. Flowering plant species observed growing along Segment A include desert buckwheat, dwarf goldenweed, cushion phlox, biscuitroot, and yarrow (St. Hilaire, 2001).

Other portions of Segment A have adequate soils to support the big sagebrush/bluebunch wheatgrass community that is the dominant potential plant community throughout the study area. Because of past disturbance, native grasses have declined, and the dominant grass species is

generally cheatgrass. Diffuse knapweed, a weedy species, is common along roadsides within Segment A, as it is throughout the study area.

One area of Segment A covered by the big sagebrush/bluebunch wheatgrass community is sufficiently pristine to qualify as a WNHP high quality plant association, as discussed above. This is the only occurrence of this high quality plant association in the study area. It occurs along approximately 0.2 mile of Segment A. Other species found in this community include occasional stiff sagebrush, bitterbrush, and gray rabbitbrush.

Segment A has two tree-lined riparian areas. Naneum Creek, in the northern portion of Segment A, is lined by scattered black cottonwoods, bittercherry, wavy-leaved alder, and aspen with a shrub understory of willows, rose, and red osier dogwood. To the southeast, Cooke Canyon Creek has a black cottonwood-lined riparian area with areas of black hawthorn, and scattered shrubs, including willows in wetter areas and ocean-spray in dry areas. Several intermittent creeks along Segment A support channel vegetation consisting mainly of upland shrubs, including ocean-spray, rose, hawthorn, and sagebrush, with an understory of cheatgrass, yarrow, chicory, and other species.

The Segment A reroute crosses an area of shrub-steppe similar to the original alignment, but crosses Cooke Canyon Creek in an area without significant riparian vegetation below the original alignment.

Segment B (Options B_{NORTH} and B_{SOUTH})

The vegetation of B_{NORTH} and B_{SOUTH} is mainly shrubland with some grasslands and has no agricultural land. Most of Options B_{NORTH} and B_{SOUTH} are covered with shrub-steppe vegetation dominated by sagebrush.

The area immediately to the west of the Columbia River is gravelly with very little vegetative cover, including a few willows scattered at the water's edge. The slope from the river leading up to the highway is vegetated with rabbitbrush, occasional sagebrush, and various grass species. Shrub-steppe tops the bare rocky cliff above the highway, extending to the west. On the east side of the Columbia River, a dry, level, sagebrush-dominated area extends along the river. Cheatgrass and knapweed are common in the understory with some native vegetation, including yarrow and buckwheat. Between the Columbia River and the Vantage Substation, the proposed line traverses a hilly, dry expanse of shrub-steppe.

Segment C

The vegetation of Segment C is mainly shrubland with some grasslands and no agricultural land. YTC categorizes their habitats as upland, riparian, alkali, or rocky habitats (USDOE, 1996). Five potential plant communities occur within these habitat types in all of the watersheds traversed by Segment C. Plant communities on YTC are generally not pristine and cheatgrass commonly replaces bluebunch wheatgrass in many areas due to past grazing.

The five plant communities within the YTC portion of Segment C include:

- **Big sagebrush/bluebunch wheatgrass:** This community is estimated to cover half of the uplands at YTC. It is found on ridgetops, hillsides, benches, and alluvial fans on shallow and deep soils. Associated species include gray and green rabbitbrush, desert

buckwheat, three-tip sagebrush, and spiny hopsage associated with various grass species. Bitterbrush is co-dominant with big sagebrush in moist sites.

- **Three-tip sagebrush/bluebunch wheatgrass:** This community is typically found on northern exposed hillslopes, canyon walls, and ridgetops, with moderately deep to deep soils. Associated species include big sagebrush, desert buckwheat, with traces of spiny hopsage, purple sage, and various grass species.
- **Stiff sagebrush/bluegrass:** This low-growing community occurs on hillsides, ridgetops, and benches in shallow soils. The climax shrub canopy is dominated by stiff sagebrush and eriogonum with traces of Wyoming big sagebrush, slenderbush eriogonum, purple sage, and bitterbrush, with a grass understory.
- **Eriogonum/ bluegrass:** This low-growing community is found on hillsides, ridgetops, and on shallow soils. The climax shrub canopy is dominated by eriogonum and either stiff sagebrush or three-tip sagebrush with a trace of Wyoming big sagebrush and purple sage. The herbaceous understory is mainly composed of grasses.
- **Alkali habitat:** This habitat type, found only in the Hanson Creek watershed, is normally found in bottomlands adjacent to intermittent streams and is occasionally associated with riparian communities bordering perennial streams. This community consists of black greasewood with traces of gray rabbitbrush.

Within the YTC, the level and type of disturbance to vegetation varies depending on the location. Most portions of the study area were grazed until 1995. Grazing reduced cover by perennial grasses and native forbs, and increased the cover by sagebrush. Grazing also damaged the vegetation in riparian areas although YTC has implemented riparian restoration projects along some creeks in the study area. Roads are present within most portions of the watershed, serving to disperse weed species. Training maneuvers occur in portions of the study area, damaging vegetation. Some of the vegetation in the study area is still in the recovery process after several fires in the 1970's and 1980's damaged vegetation. Native species were replaced with non-native species, and habitat conditions were altered due to erosion.

Although the proposed Wautoma Substation site was once a shrub-steppe community, the site is currently dominated by herbaceous species with only occasional sagebrush and rabbitbrush (St.Hilaire, 2001). This area burned sometime in the past, as evidenced by charred shrub stumps and abundant soot in the soil. Two non-native weedy species, tumble mustard and cheatgrass, are the dominant species on the site, but other common weeds include diffuse knapweed, spotted knapweed, and kochia. Native forbs scattered on the site include chaenactis, green-banded star-tulip, curve-pod milk-vetch, Grays' desert parsley, scarlet globemallow, cushion daisy, phlox, and balsamroot, all relatively common shrub-steppe species.

Segment D

The vegetation of Segment D is mainly shrubland with some grasslands, and contains the most agricultural lands of any the segments. The riparian area along the north shore of Lower Crab Creek is described as willow-dominated wetland (WDFW, April 2, 2001). Along the southern shore of Lower Crab Creek, emergent wetlands are vegetated with rushes, cat-tails, grasses, and forbs. Some Russian olive, a non-native tree, occurs in the area. To the south, the rocky, steep slopes on the north side of Saddle Mountains are described as having sparse shrub-steppe vegetation in some areas with a gentler slope. In the valley to the south, the agricultural lands are

intensively farmed with small adjacent areas that may have some remnants of native plant communities, but are more likely vegetated with non-native species.

To the north of the Columbia River, a WNHP high quality native plant community occurs along approximately 0.8 mile of Segment D. This community, the bitterbrush/Indian ricegrass community, occurs in dune areas where the sand tends to shift in the winds. This creates an unstable environment in which only certain species can survive, such as Indian rice grass, white-stemmed evening primrose, sand dock, and some short-lived annuals. In one portion of this community, big sagebrush is associated with bitterbrush and Indian ricegrass (USDOE, October, 2000). Wetland plant communities do not appear to occur along the Columbia River north of the Midway Substation, except possibly for a narrow herbaceous shoreline community.

The Midway Substation is a very dry site at the base of Umtanum Ridge. The area within and immediately adjacent to the substation has been cleared of natural vegetation, with sparse shrub-steppe extending to the base of Umtanum Ridge. Several plant communities are mapped on Umtanum Ridge and to the south (USDOE, October, 2000). Rocky areas include the rocky cliffs of Umtanum ridge and a narrow strip of talus (rock strewn area) on the top of the ridge. Rocky areas support a sparse community of plants that can exist in the small pockets of soil that accumulate in rock cracks, including several rare plant species. On the crest of Umtanum Ridge and to the south, several plant communities are mapped, including big sagebrush-spiny hopsage/Sandberg's bluegrass-cheatgrass and bunchgrass-cheatgrass communities.

On the USDOE Hanford Site and the proposed Wautoma Substation, the vegetation is mainly shrub-steppe or grassland with some agricultural land. WDFW documents the presence of nearly pristine sagebrush/ bluebunch wheatgrass shrub-steppe on the summit of Yakima Ridge (WDFW, 2001a). Segment D would terminate at the proposed Wautoma Substation. The vegetation at the proposed substation site is described in the Segment C discussion.

Segment E

The vegetation of Segment E is mainly shrubland with some grasslands and agricultural lands. The large emergent wetland south of Lower Crab Creek Road is vegetated with cat-tails and bulrush. To the south, scattered willows line the northern shore of Lower Crab Creek. The south shore of Lower Crab Creek consists of an emergent wetland vegetated with rushes, cat-tails, grasses, forbs, with scattered Russian olive (WDFW, April 2, 2001). To the south, the rocky, steep slopes on the north side of Saddle Mountains are described as having sparse shrub-steppe vegetation in areas with gentler slopes. The agricultural lands in the valley are mainly in cropland with small adjacent areas that may have some remnants of native plant communities.

The Saddle Mountains Unit of the Hanford Reach National Monument is characterized as relatively undisturbed or recovering shrub-steppe habitat, with some sand dune areas dominated by grasses, and water influenced areas mapped as riparian areas (USDOE, October 2000). Hanford Site plant community maps depict three communities in the northeastern portion of the Saddle Mountains Unit, including big sagebrush/bunchgrasses-cheatgrass, big sagebrush-spiny hopsage/bunchgrasses-cheatgrass, and a small area of rabbitbrush/bunchgrass. To the south, a large area of bitterbrush/bunchgrass sand dune complex is mapped between two large wetland areas. These communities are considered "Plant Communities of Concern on the Hanford Site" (USDOE, October 2000).

The bitterbrush/Indian ricegrass shrubland north of the Columbia River is a WNHP high quality native plant community. This community extends along the river for several miles, including about 2.5 miles along Segment E.

Wetland plant communities, dominated by herbaceous species and scattered shrubs, occur in the Saddle Mountain Wasteway, north of the Columbia River. Wetland plant communities do not occur along the shoreline of the Columbia River, except possibly for a narrow herbaceous wetland along the shoreline.

Segment F

The vegetation of Segment F is mainly shrubland with some grasslands and very little agricultural land. Immediately north of Lower Crab Creek, a dune/willow complex occurs in the area of the proposed line (WDFW, April 2, 2001). This area may be somewhat degraded due to ATV use. The south shore of Lower Crab Creek consists of an emergent wetland vegetated with rushes, cat-tails, grasses, forbs, with scattered Russian olive. To the south, the rocky, steep slopes on the north side of Saddle Mountains are described as having sparse shrub-steppe vegetation in areas with gentler slopes.

Segment F traverses the Saddle Mountains from west to east, mainly along BLM land. BLM has not mapped plant communities in this area (P. Camp, Pers. Comm. 2001). This dry south-facing slope is mainly vegetated with grasses, with very few shrubs due to fires in the past. Scattered shrubs occur, mainly in the drainageways of intermittent creeks.

As described under Segment D, the area to the north of the Columbia River, in the Saddle Mountains Unit of the Hanford Reach National Monument is characterized as relatively undisturbed or recovering shrub-steppe habitat, with some sand dune areas dominated by grasses, and water-influenced areas mapped as riparian areas (USDOE, October, 2000).

The bitterbrush/Indian ricegrass shrubland that occurs north of the Columbia River along Segment F is a WNHP high quality native plant community. This community extends along Segment F for approximately 0.3 mi.

Weed Species

Some plant species are designated as weeds by federal or state law. Past land uses in the proposed study area, such as grazing and road building, have disturbed native plant communities and favored the establishment of some weed species. Present land uses, such as the use of vehicles along dirt roads or off-road and the expansion of agriculture, continue to contribute to the spread of weed species. However, some weeds do not require disturbances in order to thrive and are able to invade natural areas quickly.

Weed species have numerous detrimental effects, and their invasion of public and private lands is a matter of great concern. Weed species reduce the quality of shrub-steppe by replacing native species, and some form monocultures, which displace the more diverse native plant communities and reduce biodiversity. Weeds reduce the quality of wildlife habitat when they replace native food sources and plant cover species, and can have an economic impact on agricultural crops. Some contribute to the rapid spread of fire by providing fuel. In addition, most weeds are not as efficient as native species at binding soil, which contributes to soil erosion by water and wind.

In Washington, weed species are addressed on a county-by-county basis. Washington State law designates some particularly troublesome weeds as “noxious weed” species. The list of noxious weed species is divided into three classes (A, B, and C) within each county, based on the state of invasion. Table 2, Weeds of Concern in the Proposed Study Area, lists the Class A and Class B weeds that are of concern within each project segment.

Class B and Class C weeds are also present in the proposed study area and may be controlled as a local option, depending on the level of threat. Spiny cocklebur, a Class C weed found in Kittitas County, is present in some areas (Segments A, B, C, and G). Bull thistle and Canada thistle are Class C or Education List weed species, found throughout the entire study area. They will spread into most disturbed areas.

Some weed species are monitored by the state when they are suspected to be a potential threat or if more information is needed on the species. Common reed is monitored in the state of Washington. It is found in some wetlands on the Hanford Site (Segments E and F), where efforts are being made to eliminate known occurrences (D. Gonzales, Pers Comm, 2001). Russian thistle, a weed known to occur on the YTC (Segment C), is also a monitor species (M. Pounds, Pers Comm., 2001).

USFWS monitors several weed species including Russian olive and saltcedar. Russian olive is not designated by the State of Washington as a noxious weed, but it is spreading uncontrollably, particularly in wetland and riparian areas. Saltcedar is limited in Washington but has the potential to rapidly spread in riparian areas. It is currently found in one small wetland in the Saddle Mountains Unit of the Hanford Reach National Monument along Segment F and may occur in the Crab Creek area.

Table 2. Weeds of Concern in the Proposed Study Area

Common Name <i>Scientific Name</i> (Washington State Class*)	Kittitas County	Yakima County	Grant County	Benton County
	Segments A, B, C	Segment C	Segments D, E, F	Segments D, E, F
Dalmatian toadflax <i>Linaria dalmatica</i> ssp. <i>dalmatica</i> (Class B)	X	X	--	--
Johnsongrass <i>Sorghum halepense</i> (Class A)	-	X	--	--
Knapweed, diffuse <i>Centaurea diffusa</i> (Class B) except Benton County – no class	X YTC	X YTC	X HAN BLM	X HAN
Knapweed, spotted <i>Centaurea biebersteinii</i> (Class B)	X YTC	X YTC	X BLM	X
Knapweed, Russian <i>Acroptilon repens</i> (Class B)	YTC	X YTC	X HAN	X HAN
Kochia <i>Kochia scoparia</i> (Class B)	YTC	YTC	--	X
Musk Thistle <i>Carduus nutans</i> (Class B)	X	X	X	--
Pepperweed, perennial <i>Lepidium latifolium</i> (Class B)	YTC	YTC	--	--
Puncturevine <i>Tribulus terrestris</i> (Class B) Grant County Education list, Benton County	-	--	HAN	HAN
Purple loosestrife <i>Lythrum salicaria</i> (Class B)	X YTC	X YTC	--	HAN
Rush Skeletonweed <i>Chondrilla juncea</i> (Class B)	--	--	X BLM	X
Saltcedar <i>Tamarix ramosissima</i> (Class A)			F HAN	
Scotch thistle <i>Onopordum acanthoides</i> (Class B)	YTC	X YTC	--	--
Sowthistle, perennial <i>Sonchus arvensis</i> (Class B)	YTC	YTC	--	--

X species name provided by County Weed Board staff
 BLM species name provided by BLM personnel
 YTC species name found within the YTC Management Plan
 HAN species name provided by Hanford Reach National Monument personnel

Rare Plants

Rare plant species vary depending on the land ownership. Table 3 identifies land ownership categories and the status of species that will be considered within each of these categories.

Table 3. Rare Species Addressed in Different Land Ownership Categories

Land Ownership/Management Category	Status of Plant Species
BLM	BLM sensitive species which includes federally listed, proposed, and candidate species and state rare species
All federally managed lands except BLM lands	Federally listed, proposed, and candidate species, federal species of concern
State owned Lands	Federally listed, proposed, candidate species, and species of concern; state endangered, threatened, and sensitive species, and a state category that includes species that are possibly extinct or extirpated in Washington
Private Lands	Federally listed, proposed, and candidate species

Information gathered on rare plant species includes the location of known occurrences and potential habitat for rare plant species. Detailed information on known occurrences, habitat preferences, and potential habitats of federally listed and candidate rare plant species are discussed below. Information on federal species of concern, BLM sensitive species, and state rare plant species includes known occurrences of these species within the study area.

Federal Listed Plants

The USFWS identified a federally listed threatened species and three federal candidate species with the potential to occur within the study area (USFWS, 2001). Table 4, Federal Status Plant Species with the Potential to Occur in the Study Area, lists the habitat and known occurrences of federal status species within the vicinity of the study area. These plants are also listed by the State of Washington (See Table 7).

Table 4. Federal Status Plant Species with the Potential to Occur in the Study Area

Common Name <i>Scientific Name</i>	Federal Status	Habitat Preference and Plant Associations	Known Occurrence(s) in the Vicinity of the Study area
Ute ladies'-tresses <i>Spiranthes diluvialis</i>	Threatened	Low elevation wetlands in valleys - associated with spikerush, sedges, grasses, and rushes	None
Northern wormwood <i>Artemisia campestris</i> var. <i>wormskioldii</i>	Candidate	Grows only within the floodplain of the Columbia River in relatively level, arid, shrub-steppe, on basalt, compacted cobble, and sand - associated with sagebrush and grasses	None within 1 mile of line segments. Several occurrences within the floodplain of the Columbia River, several miles south of the Segment B river crossing
Basalt daisy <i>Erigeron basalticus</i>	Candidate	Grows in crevices in basalt cliffs on canyon walls facing north, east, or west, from 1,250 to 1,500 feet in elevation - associated with a few grass and forb species	None within 1 mile of line segments. Occurs within Kittitas and Yakima counties along the Yakima River and Selah Creek; within the YTC, approximately 10 miles west of Segment C
Umtanum wild buckwheat <i>Eriogonum codium</i>	Candidate	Found on the exposed tops of a ridgeline that is composed of basalt, from 1,100 to 1,320 feet in elevation - associated with cheatgrass and a variety of forbs.	One known population, on Umtanum Ridge, in Benton County

Potential habitat for federal listed and candidate species occurs within the study area. Potential habitat includes any areas that meet the known habitat requirements for that species. Table 5, Habitat for Federal Listed Plant Species, lists the project segments that may contain potential habitat for federally listed and candidate species.

Because limited information is available on known occurrences of rare plant species, a preliminary rare plant field survey was conducted in August 2001 to determine where potential rare plant habitat occurs along the Preferred Alternative and to locate late blooming federally listed and candidate species. The results of this survey will be used to plan additional rare plant surveys during the spring of 2002.

Table 5. Habitat for Federal Listed Plant Species

Common Name <i>Scientific Name</i>	Segments With Potential Habitat for Federal Listed and Candidate Rare Plant Species					
	A	B	C	D	E	F
Ute ladies'-tresses <i>Spiranthes diluvialis</i>	■			■	■	■
Northern wormwood <i>Artemisia campestris</i> var. <i>wormskioldii</i>		■		■	■	■
Basalt daisy <i>Erigeron basalticus</i>			■	■		
Umtanum wild buckwheat <i>Eriogonum codium</i>				■		

Ute ladies'-tresses

Ute ladies'-tresses is a federally listed threatened species and a state threatened species. There are several occurrences of this species in Washington State, but this species is not known to occur in any of the four counties within the study area (WNHP, 2001). Ute ladies'-tresses is a perennial orchid that is generally found in low elevation wetlands in valleys and associated with spikerush, sedge species, grasses, and rushes (S. Moody, Pers. Comm. 2001). One of the known Washington State occurrences is within a periodically flooded alkaline, wet meadow that is adjacent to a sagebrush steppe community with big sagebrush, bitterbrush, and rabbitbrush, similar to habitat in the study area (WNHP, 2001).

Because Ute ladies'-tresses blooms in August and September, and surveys must be done when the species is in bloom, surveys were conducted in August 2001. No plants were found, however these areas would be resurveyed in 2002 because individuals of this species may not emerge above ground during some years.

Potential Ute ladies'-tresses habitat may occur in the wetland areas adjacent to Cooke Canyon Creek along Segment A, however none were found during the August 2001 surveys. There is a low probability that this species would occur in this area, based on the habitat characteristics identified during the surveys (Beck, Pers Comm, 2001).

The Lower Crab Creek drainage and valley wetlands along Segments D, E, and F were thought to be potential habitat for Ute ladies'-tresses. However, the species was not found during the August 2001 surveys and there is a low probability of it existing in this area since the area has been heavily grazed in recent years.

It is unlikely that Ute ladies'-tresses would occur along the riparian areas of other project segments because they would not provide enough water in the late spring and summer for this species to survive. The Hanford Reach National Monument EIS states that Ute ladies'-tresses "might be found" but is not known to occur on the Hanford Site (USDOE, 1999).

Northern wormwood

Northern wormwood is a federal candidate species and a state endangered species. Northern wormwood is known to occur in Grant County, but not in Kittitas, Benton, or Yakima counties. This species is only known to occur in two widely separated sites in Washington, both within the floodplain of the Columbia River (WNHP, 2001). The known population near the study area is

on the east side of the Columbia River, approximately 2 miles south of the area where Segment B will span the river.

The habitat of this species is relatively level, arid, shrub-steppe, where it grows on basalt, compacted cobble, and sand. This species is found in big sagebrush/bluebunch wheatgrass or bluebunch wheatgrass/ Sandberg's bluegrass associations (Daubenmire, 1970). At both known sites, the vegetative cover is sparse and northern wormwood provides less than 1 percent of the total vegetative cover.

Potential habitat for northern wormwood within the study area is limited to the edges of the Columbia River in the areas where alternatives will span the river. Segments B, D, E, and F each have one Columbia River crossing. Surveys for northern wormwood have been conducted by The Nature Conservancy (TNC) along the northern shore of the Columbia River of the Hanford Site in the vicinity of the crossings of Segments D, E, and F, but no plants were found (M. Sachschesky, Pers. Comm. 2001). The area along the Preferred Alternative will be surveyed for northern wormwood during spring of 2002.

Basalt daisy

Basalt daisy is a federal candidate species and a state threatened species only known to occur in Kittitas and Yakima counties. This endemic species occurs as a single population within an area approximately 10 miles long by 2 miles wide (WNHP, 2001). It grows in crevices in basalt cliffs on canyon walls along the Yakima River and Selah Creek, both of which cut through the Yakima Basalt Formation. One population is located on the YTC, approximately 10 miles west of Segment C (M. Pounds, Pers. Comm. 2001).

Basalt cliffs within segments C and D are potential habitat for basalt daisy. Although this species is not known to occur in Benton County, potential habitat for basalt daisy may occur on the cliffs of Yakima Ridge along segments C and D, just to the east of Yakima County. Potential habitat areas along the Preferred Alternative will be surveyed during spring of 2002.

Umtanum wild buckwheat

Umtanum wild buckwheat is a federal candidate species and a state endangered species. It is an endemic species that is only known to occur in one area in Benton County, on Umtanum Ridge (WNHP, 2001). This species was first discovered in 1995. An estimated 5,200 individuals compose the entire population of this species.

The only known occurrence of Umtanum wild buckwheat is located near Segment D on part of Umtanum Ridge, in the Midway area. The study area in the vicinity of Segment D was surveyed for rare plant species as part of the biodiversity inventory of the Hanford Site done by TNC in the 1990's.

The potential habitat along the Preferred Alternative was surveyed for Umtanum Wild Buckwheat in August 2001. Although this species blooms in the spring, it can be located in August because it is a perennial. Individuals were not found within the project area along Segment D (Beck, Pers Comm, 2001), although they were found nearby the proposed ROW.

Umtanum wild buckwheat is unlikely to occur along other project segments based on the limited geographic range of this species. Because very little is known about this species, surveys will be conducted on all basalt cliffs or ridgelines that may be impacted along the Preferred Alternative.

Federal Species of Concern

Six federal species of concern were identified by the USFWS (See Table 3.4-8). These species are also listed by the State of Washington.

BLM Sensitive Species

The Wenatchee Resource Area of the Spokane BLM District provided the sensitive species list for BLM lands within each of the four counties within the study area. Because detailed rare plant surveys have not been conducted on BLM lands within the study area, the BLM district botanist cautioned that it is impossible to determine with certainty which sensitive species might occur in the study area, without conducting field surveys (P. Camp, Pers. Comm. 2001).

The list of BLM sensitive species with the potential to occur along Segment F is included in Table 6, BLM Sensitive Rare Plant Species along Segment F. The other project segments cross only a few sections or smaller portions of sections of BLM land than Segment F. Information on the species that might occur along project segments other than Segment F is not available from the BLM (Camp, Pers. Comm. 2001). For the Preferred Alternative, the BLM sensitive plant list will be narrowed down based on the habitat preferences to determine which species might occur in the geographic area. This list of BLM sensitive species with potential habitat along the Preferred Alternative will form the basis for the field surveys during the appropriate season in 2002.

Table 6. BLM Sensitive Rare Plant Species

Species Common Name Scientific Name	Habitat Requirements
Geyer's milk-vetch <i>Astragalus geyeri</i>	Occurs in depressions in mobile or stabilized dunes, sandy flats, and valley floors within grey rabbitbrush/Indian ricegrass communities
Bristle-flowered collomia <i>Collomia macrocalyx</i>	Dry, open habitats, on talus, rock outcrops, and lithosols, in sparsely vegetated areas with a low species diversity; within sagebrush dominated communities
Gray cryptantha <i>Cryptantha leucophaea</i>	Occurs in sandy areas, on slopes associated with big sagebrush, and grasses, including Indian ricegrass, needle-and-thread grass, Sandberg's bluegrass, cheatgrass, and various forb species
Common blue-cup <i>Githopsis specularioides</i>	Open places at lower elevation, on thin soils over bedrock outcrops, talus slopes and gravelly areas
Hoover's desert-parsley <i>Lomatium tuberosum</i>	Occurs in loose talus, typically on east and north-facing slopes, within big sagebrush/bluebunch wheatgrass communities; also found in talus in drainage channels on south-facing slopes
Nuttall's sandwort <i>Minuartia nuttallii</i> var. <i>fragilis</i>	Sagebrush dominated hills to high elevation slopes, found mainly on gravelly benches or talus slopes
Cespitose evening-primrose <i>Oenothera cespitosa</i> ssp. <i>cespitosa</i>	Occurs in open sites on talus or on rocky slopes and may colonize road cuts; associated with big sagebrush, occurs in sagebrush dominated communities associated with gray rabbitbrush, Sandberg's bluegrass, needle and thread grass, Indian ricegrass, Junegrass, and forbs
Wanapum crazyweed <i>Oxytropis campestris</i> var. <i>wanapum</i>	Occurs on the summit of the Saddle Mountains, descending down the north slope; in deep sand in the big sagebrush/blue bunch wheatgrass community
<i>Texosporum santi-jacobi</i>	A pin-head lichen that occurs on soils as part of biological crust

Washington State Rare Plant Species

Known occurrences of state rare species within each segment, along lands of all ownership and management categories, are listed in Table 7, Known Occurrences of Rare Plant Species, (WNHP, 2001). Six of these species are listed as federal species of concern. All state lands along the Preferred Alternative will be surveyed for state-listed and sensitive rare plant species. The list of rare plant species for each county along the Preferred Alternative, maintained by the WNHP, will be used to determine the species that may have potential habitat along the Preferred Alternative.

Known Rare Plant Occurrences by Segment

There are no known occurrences of federally listed species along any of the project segments. A federal candidate species, Umtanum wild buckwheat, occurs in the immediate area of Segment D. Federal species of concern and state status species occur in the area of all project segments.

Table 7, Known Occurrences of Rare Plant Species, lists known occurrences of rare plant species by segment. Known occurrences within the “immediate area” of the proposed line are estimated to be within 500 feet of either or both sides of the proposed line.

Table 7. Known Occurrences of Rare Plant Species**

Common Name Scientific Name	Federal Status	State Status	Known Occurrences of Rare Plant Species Along Segments						
			A	B	C	D	E	F	G
Umtanum wild buckwheat <i>Eriogonum codium</i>	Candidate	Endangered				■*			
Columbia milk-vetch <i>Astragalus columbianus</i>	Species of Concern	Threatened		■*	■*	■*			■
Gray cryptantha <i>Cryptantha leucophaea</i>	Species of Concern	Sensitive		■		■*	■*		
Hoover's desert-parsley <i>Lomatium tuberosum</i>	Species of Concern	Threatened				■*	■*	■*	
Persistent-sepal yellowcress <i>Rorippa columbiae</i>	Species of Concern	Threatened				■*			
Hoover's tauschia <i>Tauschia hooveri</i>	Species of Concern	Threatened	■						
Dwarf evening-primrose <i>Camissonia pygmaea</i>	--	Threatened		■				■*	
Pauper milk-vetch <i>Astragalus misellus</i> var. <i>pauper</i>	--	Sensitive	■						
Naked-stemmed evening-primrose <i>Camissonia scapoidea</i>	--	Sensitive		■					■
Bristle-flowered collomia <i>Collomia macrocalyx</i>	--	Sensitive		■					■
Beaked cryptantha <i>Cryptantha rostellata</i>	--	Sensitive	■	■					■
Piper's daisy <i>Erigeron piperianus</i>	--	Sensitive				■*		■	

Common Name Scientific Name	Federal Status	State Status	Known Occurrences of Rare Plant Species Along Segments						
			A	B	C	D	E	F	G
Longsepal globemallow <i>Iliamna longisepala</i>	--	Sensitive	■						
Suksdorf's monkey-flower	--	Sensitive	■*	■			■*		■

Common Name Scientific Name	Federal Status	State Status	Known Occurrences of Rare Plant Species Along Segments						
			A	B	C	D	E	F	G
<i>Mimulus suksdorfii</i>									
Nuttall's sandwort <i>Minuartia nutallii</i> var. <i>fragilis</i>	--	Sensitive							
Tufted evening-primrose <i>Oenothera cespitosa</i> ssp. <i>cespitosa</i>	--	Sensitive		■*	■	■			■

*Occurrence in the immediate vicinity (within approximately 500 feet) of segment

**Does not include federal status plants that also have state status.

Segment A

There are no known occurrences of federally listed or candidate plants within the study area of Segment A. There are several occurrences of Hoover's tauschia (federal species of concern) within 0.4 to 1 mile of the proposed line. Suksdorf's monkey-flower (state sensitive) occurs within the immediate vicinity of the proposed line. Pauper milk-vetch, longsepal globemallow, Pauper milk-vetch, and beaked cryptantha (state sensitive species) are located approximately 0.75 to 1 mile from the segment centerline.

Option B_{NORTH}

There are no known occurrences of federally listed or candidate plants within the study area of Segment B. Columbia milk-vetch (federal species of concern and state threatened species) and tufted evening-primrose (state sensitive) occur within the immediate vicinity of the proposed line. Gray cryptantha (federal species of concern and state sensitive species) occurs within 0.25 mile of the segment centerline. Dwarf evening-primrose (state threatened) and four state sensitive species, naked-stemmed evening primrose, bristle-flowered collomia, beaked cryptantha, and Suksdorf's monkey-flower, occur approximately 0.25 to 0.5 mile from the segment centerline.

Option B_{SOUTH}

There are no known occurrences of federally listed or candidate plants within the study area of Segment B_{SOUTH}. Columbia milk-vetch (federal species of concern) occurs within 0.5 mile of the segment. Five state sensitive species occur within 1 mile of the segment: naked-stemmed evening-primrose, bristle-flowered collomia, beaked cryptantha, Suksdorf's monkey-flower, and tufted evening-primrose.

Segment C

There are no known occurrences of federally listed or candidate plants within the area of Segment C. Columbia milk-vetch (federal species of concern) occurs under and on both sides of the segment centerline. Tufted evening-primrose (state sensitive) occurs about 0.25 mile from the proposed line. The vegetation at the site of the proposed Wautoma Substation was investigated in June of 2001 and potential habitat for rare plants does not occur at this site (St. Hilaire, 2001).

Segment D

There are no federally listed plants within the area of Segment D, but there is a known occurrence of a federal candidate species, Umtanum wild buckwheat, near the segment ROW. Four federal species of concern occur in the immediate area and within 1 mile of the segment centerline: Columbia milk-vetch, persistentsepal yellowcress, gray cryptantha, and Hoover's desert parsley. Piper's daisy (state sensitive) occurs in the immediate area of the segment, while tufted evening-

primrose, also a state sensitive species, occurs approximately 0.5 mile from the segment centerline. The vegetation at the site of the proposed Wautoma Substation was investigated in June of 2001, and potential habitat for rare plants does not occur at this site (St.Hilaire, 2001).

Segment E

There are no known occurrences of federally listed or candidate plants within the study area of Segment E. Hoover's desert-parsley and gray cryptantha (both federal species of concern), occur in the immediate area of the segment. Suksdorf's monkey flower (state sensitive species) also occurs in the immediate area of the segment centerline.

Segment F

There are no known occurrences of federally listed or candidate plants within the study area of Segment F. Hoover's desert parsley (federal species of concern) occurs in the immediate vicinity of the segment and within 1 mile of the study area. Dwarf evening primrose (state threatened) occurs in the immediate vicinity of the segment. Piper's daisy (state sensitive) occurs approximately 0.25 mile from the segment centerline.

Table 8. Plant Species Mentioned in EIS text by Common Name

Common Name * = non-native species	Scientific Name
Aspen	<i>Populus tremuloides</i>
Balsamroot	Various species of <i>Balsamorhiza</i>
Basalt daisy	<i>Erigeron basalticus</i>
Beaked cryptantha	<i>Cryptantha rostellata</i>
Big sagebrush	<i>Artemisia tridentata</i>
Biscuitroot	<i>Lomatium macrocarpum</i>
Bitterbrush	<i>Purshia tridentata</i>
Black cottonwood (=cottonwood)	<i>Populus trichocarpa</i>
Black greasewood	<i>Sarcobatus vermiculatus+</i>
Black hawthorn	<i>Crataegus douglasii</i>
Bluebunch wheatgrass	<i>Agropyron spicatum</i> or <i>Pseudoroegneria spicata</i>
Blue elderberry	<i>Sambucus cerulea</i>
Bristle-flowered collomia	<i>Collomia macrocalyx</i>
*Bull thistle	<i>Cirsium vulgare</i>
Bulrush	Various species of <i>Scirpus</i>
*Canada thistle	<i>Cirsium arvense</i>
Cattail	<i>Typha latifolia</i>
Cespitose evening-primrose	<i>Oenothera cespitosa</i> ssp. <i>cespitosa</i>
Chenactis	<i>Chaenactis douglasii</i>
*Cheatgrass	<i>Bromus tectorum</i>
*Chicory	<i>Chichorium intybus</i>
Chokecherry	<i>Prunus virginiana</i>
Columbia milk-vetch	<i>Astragalus columbianus</i>
Common blue-cup	<i>Githopsis specularioides</i>
Common reed	<i>Phragmites australis</i>
Cottonwood (=black cottonwood)	<i>Populus trichocarpa</i>
Curve-pod milk-vetch	<i>Astragalus spherocarpus</i>
Cushion daisy	<i>Erigeron poliospermus</i>
Cushion phlox	<i>Phlox hoodii</i>
* Dalmatian toadflax	<i>Linaria dalmatica</i> ssp. <i>dalmatica</i>
Desert buckwheat	Various species of <i>Eriogonum</i>
*Diffuse knapweed	<i>Centaurea diffusa</i>
Dwarf goldenweed	<i>Haplopappus acaulis</i>
Dwarf evening-primrose	<i>Camissonia pygmaea</i>
Eriogonum	Various species of <i>Eriogonum</i>
Geyer's milk-vetch	<i>Astragalus geyeri</i>
Golden currant	<i>Ribes aureum</i>
Gray cryptantha	<i>Cryptantha leucophaea</i>
Grays' desert parsley	<i>Lomatium grayi</i>
Gray rabbitbrush	<i>Chrysothamnus nauseosus</i>
Green-banded star-tulip	<i>Calocarpus macrocarpus</i>
Green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>
Hoover's desert-parsley	<i>Lomatium tuberosum</i>
Hoover's tauschia	<i>Tauschia hooveri</i>
Idaho fescue	<i>Festuca idahoensis</i>
Indian ricegrass	<i>Oryzopsis hymenoides</i>
*Johnsongrass	<i>Sorghum halepense</i>
Junegrass	<i>Koeleria cristata</i>
*Kochia	<i>Kochia scoparia</i>

Common Name * = non-native species	Scientific Name
Low sagebrush	<i>Artemesia arbuscula</i>
Mint	<i>Mentha arvensis</i>
Mock orange	<i>Philadelphus lewisii</i>
*Musk thistle	<i>Carduus nutans</i>
Naked-stemmed evening-primrose	<i>Camissonia scapoidea</i>
Needle-and-thread grass	<i>Stipa comata</i>
Northern wormwood	<i>Artemesia campestris</i> var. <i>wormskioldii</i>
Nuttall's sandwort	<i>Minuartia nuttallii</i> var. <i>fragilis</i>
Oceanspray	<i>Holodiscus discolor</i>
Oregon sunshine	<i>Eriophyllum lanatum</i>
Pauper milk-vetch	<i>Astragalus misellus</i> var. <i>pauper</i>
Penstemon	<i>Penstemon</i> sp.
*Perennial pepperweed	<i>Lepidium latifolium</i>
*Perennial sowthistle	<i>Sonchus arvensis</i>
Persistent-sepal yellowcress	<i>Rorippa columbiae</i>
Phlox	<i>Phlox</i> sp.
Piper's daisy	<i>Erigeron piperianus</i>
Ponderosa pine	<i>Pinus ponderosa</i>
*Puncturevine	<i>Tribulus terrestris</i>
*Purple loosestrife	<i>Lythrum salicaria</i>
Purple sage	<i>Salvia dorrii</i>
Rabbitbrush (either gray or green rabbitbrush)	Either <i>Chrysothamnus naseous</i> or <i>C. viscidiflorus</i>
Rabbitfoot grass	<i>Polypogon monspeliensis</i>
Red osier dogwood	<i>Cornus stolonifera</i>
Rock eriogonum (=buckwheat)	Various species of <i>Eriogonum</i>
Rose	Various species of <i>Rosa</i>
*Rush skeletonweed	<i>Chondrilla juncea</i>
Rushes	Various species of <i>Juncus</i>
*Russian Knapweed	<i>Acroptilon repens</i>
*Russian olive	<i>Elaeagnus angustifolia</i>
*Russian thistle	<i>Salsola iberica</i>
Sagebrush	Various species of <i>Artemesia</i> , see big sagebrush, threetip sagebrush, stiff sagebrush and low sagebrush
Saltgrass	<i>Distichlis spicata</i>
Sandberg's bluegrass	<i>Poa sandbergii</i> or <i>Poa secunda</i>
Sand dock	<i>Rumex venosus</i>
Scarlet globe mallow	<i>Spaheralcea coccinea</i>
* Scotch thistle	<i>Onopordum acanthoides</i>
Sedge	Various species of <i>Carex</i>
Sego lily	Various species of <i>Calochortus</i>
Serviceberry	<i>Amelanchier alnifolia</i>
Slenderbush eriogonum or buckwheat	<i>Eriogonum microthecum</i>
Spikerush	Various species of <i>Eleocharis</i>
*Spiny cocklebur	<i>Xanthium spinosum</i>
Spiny hopsage	<i>Grayia spinosa</i> or <i>Atriplex spinosa</i>
*Spotted knapweed	<i>Centaurea maculosa</i>
Stiff sagebrush	<i>Artemesia rigida</i>
Stinging nettle	<i>Urtica dioica</i>
Suksdorf's monkey-flower	<i>Mimulus suksdorfii</i>
Teasel	<i>Dipsacus sylvestris</i>
Threetip sagebrush	<i>Artemisia tripartita</i>

Common Name * = non-native species	Scientific Name
Tufted evening-primrose	<i>Oenothera cespitosa ssp. cespitosa</i>
*Tumble mustard	<i>Sisymbrium altissimum</i>
Umtanum wild buckwheat	<i>Eriogonum codium</i>
Ute ladies'-tresses	<i>Spiranthes diluvialis</i>
Wallflower	<i>Erysimum sp.</i>
Wanapum crazyweed	<i>Oxytropis campestris var. wanapum</i>
Wax currant	<i>Ribes cereum</i>
White currant	<i>Ribes cereum</i>
White-stemmed evening primrose	<i>Oenothera pallida</i>
Wild rose	Various species of <i>Rosa</i>
Willow	Various species of <i>Salix</i>
Wyoming big sagebrush	<i>Artemesia tridentata ssp. wyomingensis</i>
Wood's rose	<i>Rosa woodsii</i>
Yarrow	<i>Achillea millefolium</i>
Taxonomy follows Hitchcock and Cronquist, 1973.	

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